

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

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26 JAN 2005

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)Date of mailing
(day/month/year)

24.01.2005

Applicant's or agent's file reference
PN914PCT/PBS

IMPORTANT NOTIFICATION

International application No.
PCT/E 03/00132International filing date (day/month/year)
30.09.2003Priority date (day/month/year)
04.10.2002Applicant
MINROC TECHNICAL PROMOTIONS LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)

Applicant's or agent's file reference PN914PCT/PBS	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/E 03/00132	International filing date (day/month/year) 30.09.2003	Priority date (day/month/year) 04.10.2002
International Patent Classification (IPC) or both national classification and IPC E21B4/14		
Applicant MINROC TECHNICAL PROMOTIONS LIMITED et al.		



- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 21.04.2004	Date of completion of this report 24.01.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Georgescu, M Telephone No. +49 89 2399-7502 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/IE 03/00132**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*

Description, Pages

1, 2, 4-13 as originally filed
3 received on 06.01.2005 with letter of 06.01.2005

Claims, Numbers

1-9 received on 06.01.2005 with letter of 06.01.2005

Drawings, Sheets

1/8-8/8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/E 03/00132**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-9
	No: Claims	
Inventive step (IS)	Yes: Claims	1-9
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-9
	No: Claims	

- 2. Citations and explanations**
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IE 03/00132

Reference is made to the following documents:

D1: US 5 944 117

D2: WO 99 67065

V - Reasoned statement under Article 35(2)

V-1 Claim 1

The distinguishing feature of claim 1 with regard to D1 is that "the abutment of the inner cylinder is an inwardly-directed abutment".

The subject-matter of claim 1 is therefore new and the claim meets the novelty requirement of Art. 33(2)PCT.

The distinguishing feature of claim 1 appears to solve the problem of distributing the efforts initially existing on the wear sleeve of D1 to other elements of the assembly which can better support such efforts. Through the presence of the second threaded assembly between the top locking member and the air distributor the threaded assembly between the wear sleeve and the distributor mount is partially relieved, and through the configuration with an inwardly-directed abutment of the inner cylinder instead of the outwardly-directed abutment of D1 the effort resulted after clamping the abutment is no longer transmitted to the wear sleeve but to the air distributor, distributor mount and top locking member. Thus, early failure of the wear sleeve in the region of the abutment is prevented.

Therefore, claim 1 meets the requirement for inventive step of Art. 33(3) PCT.

V-2 Claims 2 to 9

Claims 2 to 9 as dependent claims from claim 1 also meet the requirements of Art. 33 PCT.

The following objection is raised:

The independent claims are not properly cast in the two part form, with those features which in combination are part of the closest prior art (D1) being placed in the preamble, contrary to the requirements of Rule 6.3(b) PCT.

Other manufacturers have in the past made the inner cylinder as part of a threaded component which screws into the outer wear sleeve. The disadvantage of this is that the hammer wears externally and in many cases it is rebuilt by replacing all external components. This would obviously be extremely expensive in the above scenario. There is also the issue of the clearance which would be necessary, between the external diameter of the inner cylinder portion and the bore of the wear sleeve, to allow the component to screw into the wear sleeve. As will be explained below the clearance needs to be minimised to optimise the concentricity of the inner cylinder bore and the wear sleeve bore.

In other known prior art percussion hammers the inner cylinder is mounted within the outer wear sleeve by means of a compressible retaining ring, such as a circlip, which is expanded outwardly to seat into the groove or shoulder formed on the inner diameter of the outer wear sleeve.

The outer wear sleeve of down-the-hole hammers is subject to very strong abrasive forces when in use causing significant wear of, and removal of metal from, the outer sleeve. This weakens the outer wear sleeve to the point where it has to be replaced. In the prior art hammers described the provision of circumferential seating grooves for circlips, seating rings and the like, in the inner face of the wear sleeve reduce the wear thickness of the outer sleeve. This means that the outer wear sleeve has to be replaced more quickly than would be the case if the wear sleeve contained no more grooves.

In other prior art down-the-hole hammers (e.g. those having a seating ring) the inner cylinder is located on a shoulder provided by a groove in the wear sleeve. It is then locked in position by the application of torque at the backhead, which locks down on a compression ring or the like. The result is that there is a significant locking force which acts between the shoulder and the threads of the wear sleeve. The possibility that this force could cause distortion on the wear sleeve will increase as the external wear on the wear sleeve outer diameter increases. For example, US 5994117 discloses a locking system in which an outwardly-directed annular boss on the inner cylinder engages with a ridge on the outer wear sleeve.

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Claims

1. A fluid-operated percussion drill tool, in particular a down-the-hole hammer, comprising an external cylindrical outer wear sleeve (10), an inner cylinder (9) mounted co-axially within the outer wear sleeve (10), a sliding piston (11) mounted for reciprocating movement within the inner cylinder (9) and the outer wear sleeve (10), to strike a hammer bit (36) mounted at the lower end of the outer wear sleeve (10), and the inner cylinder (9) has an abutment (15) which engages with a complementary engagement means characterised in that the abutment of the inner cylinder (9) is an inwardly-directed abutment (15) which in the assembled tool is clamped between a complementary engagement means (38) and a locking means (2) such that the inner cylinder (9) is rigidly mounted and held in the drill tool assembly relative to the outer wear sleeve (10).
2. A fluid-operated percussion drill tool as claimed in claim 1, characterised in that the top end of the outer wear sleeve (10) is screw-threadably engaged with the lower end of an annular air distributor mount (2), the top end of the inner cylinder (9) abuts the lower end of the distributor mount (2), a lower end of the air distributor (3) abuts the inwardly-directed abutment (15) in the inner cylinder (9) and is threadably engaged at its upper end with a top locking member (1) which in its locked position abuts the top of the air distributor mount (2).
3. A tool as claimed in claim 1, characterised in that there is an elongate cylindrical air distributor (3) positioned within the hammer assembly and the inwardly-directed abutment (15) on the inner cylinder (9) engages with a complementary abutment (38) on the air distributor (3) and locking means (2) connected to the outer wear sleeve (10) are provided to clamp the abutment (15) between the abutment (38) on the air distributor (3), and the locking means is such that the inner cylinder (9) is rigidly mounted in the drill assembly relative to the outer wear sleeve (10).

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4. A tool as claimed in claim 1 or claim 3, characterised in that the locking means comprises an annular air distributor mount (2) the lower end of which is screw-threadably engaged with the top end of the outer wear sleeve (10).

5. A tool as claimed in claim 4 characterised in that the air distributor (3) is threadably engaged at its upper end with a top locking member (1) which abuts the top of the air distributor mount (2).

10 6. A tool as claimed in any of the preceding claims characterised in that the inwardly directed abutment of the inner cylinder (9) is an inwardly-directed annular shoulder (15) which is clamped between the complementary engagement means, which comprises an outwardly-directed annular flange (38), and the locking means (2).

15 7. A tool as claimed in any one of the preceding claims characterised in that it comprises a top locking member (1) screw threadably mounted on an annular air-distributor 3, which is fitted concentrically through an inner cylinder (9) and an annular distributor mount (2), and an annular flange (38) on the lower end of the air-distributor (3) abuts the underside of an inwardly-directed abutment (15) in inner cylinder (9), and a top end (14) of the inner cylinder (9) abuts a lower end of the distributor mount (2)
20 whereby the inner cylinder (9) is locked in position.

8. A tool as claimed in claim 7, characterised in that the top end of the inner cylinder (9) comprises an annular shoulder or flange (14) which is rigidly held between an annular flange (38) on the lower end of air-distributor (3) which abuts an annular shoulder (15)
25 of the inner cylinder (9), and the lower end of the distributor mount (2).

9. A tool as claimed in any one of claims 2 to 8, characterised in that the bottom of the top locking member (1) has a flat annular rim (12) which engages a complementary flat shoulder (13) on the top end of the distributor mount (2).

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